# AT-WR4541a/g

## IEEE 802.11 Dual Band Outdoor Wireless Routing CPEs

**AT-WR4541a**
IEEE 802.11a/b/g/h outdoor wireless routing CPE with 15dBi 5GHz embedded panel antenna

**AT-WR4541g**
IEEE 802.11a/b/g/h outdoor wireless routing CPE with 11dBi 2.4GHz embedded panel antenna

### A Complete Solution for Wireless ISPs, Local Utilities, Municipalities, Hospitality and Enterprises

The WR4500 family of dual band outdoor wireless base routers and routing CPEs allow the building of wireless only or hybrid IP networks that are scalable, reliable and fully controllable.

Wireless ISPs can easily and quickly provide homes in rural areas with broadband Internet access and VoIP telephony and, at the same time, can set-up WiFi hot spots for nomadic users.

Enterprises can connect remote buildings without the need for expensive leased lines and can extend WiFi coverage to outdoor yards providing users with mobile intranet and Internet access everywhere.

Municipalities can build wireless IP networks for connecting remote offices and for increasing public safety with real time monitored surveillance cameras and continuous communication with local police patrols. Local utilities can easily control their remote equipments and read, in real time, gas, water and electricity meters without any need for expensive fiber cabling.

Hot spot services can be provided to hotel guests and hospital patients 'illuminating' rooms from outside the building with a reduced impact on medical equipments because no transmit radio will be installed inside the hospital.

Both models can be used either as CPEs in Point to Multipoint links or as both ends of a Point to Point link.

Flexibility is the primary advantage of AT-WR4541 wireless routing CPEs. Both models share the same firmware, radio module and enclosure. The only difference is in the embedded panel antenna: AT-WR4541a features a 15dBi 5GHz antenna while AT-WR4541g is equipped wth an 11 dBi 2.4GHz antenna.

Both models feature an additional type N coax connector for using any 2.4 or 5GHz external antennas.

### Real Wireless IP Routers

WR4500 dual band wireless routers have all the features of IP routers and much more. A full set of routing protocols together with enhanced filtering capabilities make the WR4500 series the best choice for building simple and complex wireless and hybrid (wired-wireless) networks with a tight integration between the wired and wireless parts.

IP routing allows network designers to design and deploy fully redundant networks with predictable behaviour in any working condition, while network operations managers retain full control over packet forwarding.

Point to Point, Point to Multipoint as well as partially or fully meshed networks can be easily designed and deployed with limited need for deciding in advance the network architecture. Common network management tools can be used for configuring and monitoring the network and its users the usual way. Any network engineer will be able, with little wireless training, to design and troubleshoot an Allied Telesis powered wireless network.

### Key Features

- Feature rich firmware
- Real IP routing functionalities
- 2.4 GHz and 5 GHz dual band operations
- IEEE 802.11a/b/g/h compliant
- Certified for HiperLAN bands operation in Europe with DFS and TPC
- Power over Ethernet remote powering
- IP67 rated outdoor robust construction
- Professional look suitable for indoor installation too
- Embedded IP firewalling functionalities
- Highly configurable QoS management for multimedia applications
- High sensitivity radio interface for longer reach and higher throughput on wireless links
- Wide choice of omnidirectional, directional and sector antennas
- RoHS compliant
- TDMA operation mode for full QoS control on wireless
- Multicast routing via PIM and IGMP

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## Wireless Networking Made Easy

Wireless specific functionalities are integrated in the WR4500 firmware in such a way that setting up a Point to Point link is as easy as configuring an interface.

## Specifications

### Physical Specifications

| | |
|---|---|
| Dimensions (W x D x H) | 13.3cm x 8.6cm x 16cm<br>5.2" x 3.4" x 6.3" |
| Weight | 0.45 Kg (1.0 lbs) main unit only<br>0.59 Kg (1.3 lbs) with mount kit |

Low flammability UL94-V0 plastic and aluminium enclosure

### Environmental Specifications

| | |
|---|---|
| Operating conditions | |
| temperature: | -30°C to +65°C<br>(-22°F to +140°F) |
| Relative humidity: | 5% to 95% (non-condensing) |
| Storage conditions | |
| temperature: | -40°C to +70°C<br>(-40°F to +158°F) |
| Relative humidity: | 5% to 95% (non-condensing) |
| Robustness IEC 60529 protection Level: | IP67<br>(with optional AT-TQ0051/3, UTP cables) |
| MTBF: | 39,000 hrs |

### Power Characteristics

| | |
|---|---|
| Power: | PoE 12 to 24vDC, 0.8A Max |
| Power consumption: | 7W |

### Interfaces

| | |
|---|---|
| Fast Ethernet interfaces | |
| Standard: | IEEE 802.3u (MDI/MDI-X) |
| Ports: | 1 |
| Connector: | RJ-45 female |
| Radio interfaces | |
| Radio: | 1 |
| Standard: | IEEE 802.11a/b/g/h |
| Connectors: | 1 x N type female |

## Layer 2 Features

### Bridging

- IEEE 802.1D Spanning-Tree Protocol
- IEEE 802.1w Rapid Spanning-Tree Protocol
- Multiple bridge interfaces
- Bridge firewalling
- MAC NAT

### VLAN

- IEEE 802.1Q VLAN tagging on Ethernet and wireless links
- VLAN bridging

## Layer 3 Features

### Routing

- Static routing
- Equal cost multi-path routing
- Policy-based routing
- RIPv1 / v2
- OSPFv2
- PIM
- IGMP

### Firewall and NAT

- Stateful packet filtering
- Peer-to-Peer protocol filtering
- Source and destination NAT
- Packet classification by:
  - Source MAC
  - Interfaces
  - IP addresses and subnets
  - Ports and port range
  - Protocols
  - Protocol options (ICMP type, TCP flags and MSS)
  - ToS (DSCP)
  - Packet content (matching sequence/frequency)
  - Packet size
  - Time

### QoS management

- Hierarchical HTB QoS system with bursts
- Per IP / protocol / subnet / port / firewall mark
- PCQ, RED, SFQ, FIFO queue
- CIR, MIR, contention ratios, dynamic client rate equalizing (PCQ), bursts, peer-to-peer protocol limitation

### Tunneling protocols

- PPTP, PPPoE and L2TP
- PAP, CHAP, MSCHAPv1 and MSCHAPv2 authentication protocols
- RADIUS authentication and accounting
- MPPE encryption; compression for PPPoE
- Data rate limitation
- Differentiated firewall
- PPPoE dial on demand
- IPIP tunnels, EoIP (Ethernet over IP)

### IPSec

- IP security AH and ESP protocols
- MODP Diffie-Hellman groups 1,2,5
- MD5 and SHA1 hashing algorithms
- DES, 3DES, AES-128, AES-192, AES-256 encryption algorithms
- Perfect Forwarding Secrecy (PFS) MODP groups 1,2,5

### Proxy

- FTP and HTTP caching proxy server
- HTTPS proxy
- Transparent DNS and HTTP proxying
- SOCKS protocol support
- DNS static entries
- Support for caching on a separate drive
- Access Control Lists
- Caching lists
- Parent proxy support

### DHCP

- DHCP server per interface
- DHCP relay
- DHCP client
- Multiple DHCP networks
- Static and dynamic DHCP leases
- RADIUS support

### VRRP

- VRRP protocol for high availability

### UPnP

- Universal Plug & Play support

### NTP

- Network Time Protocol server and client

### Monitoring/accounting

- IP traffic accounting
- Firewall actions logging
- Statistics graphs accessible via HTTP GUI

### Management

- SNMP V2 read-only
- SSH and Telnet CLI
- Web GUI
- Windows-based GUI

### Tools

- Ping
- Traceroute
- Bandwidth test
- Ping flood
- Packet sniffer
- Dynamic DNS update tool

## Wireless Features

### Operation modes

- Point to Point
- Point to Multipoint
- WDS: Wireless Distribution System
- Wireless client (station mode)
- Wireless bridging
- Dynamic Frequency Selection (DFS)
- Transmit Power Control (TPC)

### Access security

- 40 and 104-bit WEP
- WPA-PSK and WPA-EAP
- WPA2-PSK and WPA2-EAP
- AES-CCM and TKIP encryption
- Access Control List
- Std FIPS 197 AES

### Authentication

- RADIUS
- EAP and IEEE 802.1x

## Technical Specifications

### Standards and Protocols

#### IEEE

| | |
|---|---|
| IEEE 802.1D | MAC bridges |
| IEEE 802.1Q | Virtual LANs |
| IEEE 802.1x | Port-based network access control |
| IEEE 802.1w | Rapid reconfiguration of Spanning-Tree |
| IEEE 802.2 | Logical link control |
| IEEE 802.3-2002 | CSMA/CD access method and physical layer specifications |
| IEEE 802.3u | 100TX |
| IEEE 802.3x | Full-duplex operation |
| IEEE 802.11a | WLAN MAC and PHY specifications. High-speed physical Layer in the 5 GHz band |
| IEEE 802.11b | WLAN MAC and PHY specifications. Higher-speed physical layer extension in the 2.4 GHz band |
| IEEE 802.11g | WLAN MAC and PHY specifications. Amendment 4: further higher data rate extension in the 2.4 GHz band |
| IEEE 802.11h | WLAN MAC and PHY specifications. Amendment 5: spectrum and transmit power management extensions in the 5 GHz band in Europe |
| IEEE 802.11i | WLAN MAC and PHY specifications. Amendment 6: MAC security enhancements |

#### IETF

| | |
|---|---|
| RFC 768 | UDP |
| RFC 791 | IP |
| RFC 792 | ICMP |
| RFC 793 | TCP |
| RFC 826 | ARP |
| RFC 854 | Telnet protocol specification |
| RFC 855 | Telnet option specifications |
| RFC 856 | Telnet binary transmission |
| RFC 857 | Telnet echo option |
| RFC 858 | Telnet suppress go ahead option |
| RFC 932 | Subnetwork addressing scheme |
| RFC 950 | Subnetting, ICMP |
| RFC 951 | BootP |
| RFC 959 | FTP |
| RFC 1027 | Proxy ARP |
| RFC 1035 | DNS |
| RFC 1058 | RIPv1 |
| RFC 1091 | Telnet terminal-type option |
| RFC 1122 | Internet host requirements |
| RFC 1155 | MIB |
| RFC 1157 | SNMP |
| RFC 1212 | Concise MIB definitions |
| RFC 1213 | MIB-II |
| RFC 1245 | OSPF protocol analysis |
| RFC 1246 | Experience with the OSPF protocol |
| RFC 1256 | ICMP router discovery messages |
| RFC 1305 | NTP version 3 |
| RFC 1334 | PPP authentication protocols |
| RFC 1350 | TFTP |
| RFC 1493 | Definitions of managed objects for bridges |
| RFC 1518 | An architecture for IP address allocation with CIDR |
| RFC 1519 | Classless Inter-Domain Routing (CIDR) |
| RFC 1542 | Clarifications and extensions for the BootStrap protocol |
| RFC 1592 | Simple Network Management Protocol (SNMP) distributed protocol interface V.2.0 |
| RFC 1631 | The IP Network Address Translator (NAT) |
| RFC 1643 | Ethernet MIB |
| RFC 1661 | The Point-to-Point Protocol (PPP) |
| RFC 1701 | GRE |
| RFC 1702 | GRE over IPv4 |
| RFC 1793 | Extending OSPF to support demand circuits |
| RFC 1812 | Router requirements |
| RFC 1829 | IPSec algorithm |
| RFC 1858 | Fragmentation |
| RFC 1877 | PPP Internet protocol control protocol extensions for name server addresses |
| RFC 1918 | IP addressing |
| RFC 1945 | HTTP/1.0 |
| RFC 1994 | PPP Challenge Handshake Authentication Protocol (CHAP) |
| RFC 2003 | IP encapsulation within IP |
| RFC 2011 | SNMPv2 Management Information Base for the Internet protocol using SMIv2 |
| RFC 2049 | MIME |
| RFC 2068 | HTTP/1.1 |
| RFC 2082 | RIP-2 MD5 authentication |
| RFC 2096 | IP forwarding table MIB |
| RFC 2113 | IP router alert option |
| RFC 2131 | DHCP |
| RFC 2136 | Dynamic updates in the Domain Name System (DNS UPDATE) |
| RFC 2236 | Internet Group Management Protocol, version 2 |
| RFC 2246 | The TLS protocol version 1.0 |
| RFC 2284 | EAP |
| RFC 2328 | OSPFv2 |
| RFC 2338 | Virtual Router Redundancy Protocol |
| RFC 2401 | Security architecture for IP |
| RFC 2402 | IP authentication header |
| RFC 2403 | IPSec authentication - MD5 |
| RFC 2433 | Microsoft PPP CHAP extensions |
| RFC 2453 | RIPv2 |
| RFC 2474 | DCSP in the IPv4 and IPv6 headers |
| RFC 2516 | A method for transmitting PPP Over Ethernet (PPPoE) |
| RFC 2616 | Hypertext Transfer Protocol - HTTP/1.1 |
| RFC 2637 | Point-to-Point Tunneling Protocol (PPTP) |
| RFC 2661 | L2TP |
| RFC 2663 | IP Network Address Translator (NAT) terminology and considerations |
| RFC 2759 | Microsoft PPP CHAP extensions, version 2 |
| RFC 2790 | Host MIB |
| RFC 2863 | The interfaces group MIB |
| RFC 2865 | RADIUS |
| RFC 2866 | RADIUS accounting |
| RFC 3007 | Secure Domain Name System (DNS) dynamic update |
| RFC 3022 | Traditional NAT |
| RFC 3046 | DHCP relay agent information option |
| RFC 3164 | Syslog protocol |
| RFC 3168 | The addition of Explicit Congestion Notification (ECN) to IP |
| RFC 3376 | Internet Group Management Protocol, version 3 |
| RFC 3768 | VRRP |
| RFC 4251 | The Secure Shell (SSH) protocol architecture |
| RFC 4601 | Protocol Independent Multicast - Sparse Mode (PIM-SM): protocol specification (revised) |
| RFC 5059 | Bootstrap Router (BSR) mechanism for PIM |

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## Radio Characteristics

| Frequency band: | 2.4 GHz | 5 GHz |
|---|---|---|
| **Radio type:** | IEEE 802.11b/g | IEEE 802.11a/h |
| **Modulation:** | | |
| 1Mbps | DBPSK (DSSS) | n.a. |
| 2Mbps | DQPSK (DSSS) | n.a. |
| 5.5 and 11Mbps | CCK (DSSS) | n.a. |
| 6 and 9Mbps | PSK (OFDM) | |
| 12 and 18Mbps | QPSK (OFDM) | |
| 24 and 36Mbps | 16-QAM (OFDM) | |
| 48 and 54Mbps | 64-QAM (OFDM) | |
| **Channels:** | | |
| US/Canada (FCC) | 11 overlapping (1 to 11) | 12 non overlapping (5.150 to 5.350; 5.725 to 5.825) |
| Europe (ETSI) | 13 overlapping (1 to 13) | 19 non overlapping (5.150 to 5.350; 5.470 to 5.725) |
| France | 4 overlapping (10 to 13) | 19 non overlapping (5.150 to 5.350; 5.470 to 5.725) |
| Japan (Telec) | 13 overlapping (1 to 13) | 4 non overlapping (5.150 to 5.250) |
| China | 13 overlapping (1 to 13) | 5 non overlapping (5.725 to 5.850) |
| Other countries | Per local regulations | |

| | Standard | Data Rate (Mbps) | | Receive Sensitivity (dBm) | Max Output Power (*) (dBm) |
|---|---|---|---|---|---|
| | | Normal Mode | Super AG Mode | | |
| AT-WR4541a & AT-WR4541g | IEEE 802.11a/h | 6 | 12 | -88 | 17 |
| | | 9 | 18 | -87 | 17 |
| | | 12 | 24 | -85 | 16 |
| | | 18 | 36 | -83 | 16 |
| | | 24 | 48 | -80 | 15 |
| | | 36 | 72 | -75 | 15 |
| | | 48 | 96 | -73 | 14 |
| | | 54 | 108 | -71 | 13 |
| | IEEE 802.11b | 1 | n.a. | -95 | 18 |
| | | 2 | | -94 | 18 |
| | | 5.5 | | -92 | 18 |
| | | 11 | | -90 | 18 |
| | IEEE 802.11g | 6 | 12 | -90 | 18 |
| | | 9 | 18 | -89 | 18 |
| | | 12 | 24 | -87 | 17 |
| | | 18 | 36 | -85 | 17 |
| | | 24 | 48 | -82 | 16 |
| | | 36 | 72 | -79 | 16 |
| | | 48 | 96 | -76 | 15 |
| | | 54 | 108 | -74 | 15 |

(*) This is the actual Radio Output Power and does not include the Antenna gain.

## Regulatory Approvals

EMI/EMC: FCC part 15 Class B
CE marking Class A

Safety: IEC60950, UL60950, CSA60950, EN60950

RoHS compliant

## Ordering Information

AT-WR4541a-xx
IEEE 802.11a/b/g/h outdoor wireless routing CPE with 15dBi 5GHz embedded panel antenna

AT-WR4541g-xx
IEEE 802.11a/b/g/h outdoor wireless routing CPE with 11dBi 2.4GHz embedded panel antenna

Where xx = 10 for North America
30 for UK
40 for Australian
50 for European

## Associated Products

AT-TQ00xx
Cables and accessories

AT-TQ02xx
2.4GHz antennas and accessories

AT-TQ05xx
5 GHz antennas and accessories

AT-WR4561-00
IEEE 802.11 dual band single radio outdoor with wireless base router

AT-WR4562-00
IEEE 802.11 dual band dual radio outdoor with wireless base router

AT-WR4542
IEEE 802.11a/h outdoor wireless routing CPE with 22dBi 5GHz embedded panel antenna

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